

**WILDLIFE AND WILDLIFE HABITAT LOSS ASSESSMENT  
AT FEDERAL HYDROELECTRIC FACILITIES  
WILLAMETTE RIVER BASIN, OREGON**

**FINAL REPORT**

**By**

**J. H. Noyes  
M. S. Potter**

**Oregon Department of Fish and Wildlife  
Environmental Management Section**

**Prepared For**

**Jim Meyer, Project Manager**

**U.S. Department of Energy**

**Bonneville Power Administration**

**Division of Fish and Wildlife**

**in compliance with Northwest Power Planning Council's**

**Columbia River Basin**

**Fish and Wildlife Program**

**Contract No. DE-AI-84BP18969**

**Project No. 84-36**

**February 1986**

## ABSTRACT

Habitat based assessments were conducted of the U.S. Army Corps of Engineers' hydroelectric projects in the Willamette River Basin, Oregon, to determine losses or gains to wildlife and/or wildlife habitat resulting from the development and operation of the hydroelectric-related components of the facilities. Preconstruction, postconstruction, and recent vegetation cover types at the project sites were mapped based on aerial photographs. Vegetation cover types were identified within the affected areas and acreages of each type at each period were determined. Wildlife target species were selected to represent a cross-section of species groups affected by the projects. An inter-agency team evaluated the suitability of the habitat to support the target species at each project for each time period. An evaluation procedure which accounted for both the quantity and quality of habitat was used to aid in assessing impacts resulting from the projects. The Willamette projects extensively altered or affected 33,407 acres of land and river in the McKenzie, Middle Fork Willamette, and Santiam river drainages. Impacts to wildlife centered around the loss of 5,184 acres of old-growth conifer forest, and 2,850 acres of riparian hardwood and shrub cover types. Impacts resulting from the Willamette projects included the loss of critical winter range for black-tailed deer and Roosevelt elk, and the loss of year-round habitat for deer, upland game birds, furbearers, spotted owls, pileated woodpeckers, and many other wildlife species. Bald eagles and ospreys were benefited by an increase in foraging habitat. The potential of the affected areas to support wildlife was greatly altered as a result of the Willamette projects. Losses or gains in the potential of the habitat to support wildlife will exist over the lives of the projects. Cumulative or system-wide impacts of the Willamette projects were not quantitatively assessed.

## TABLE OF CONTENTS

	<u>Page</u>
ABSTRACT	
I. INTRODUCTION.....	1
II. STUDY AREA.....	1
A. Project Descriptions.....	1
B. Study Area Description.....	2
C. Land Ownership.....	2
III. METHODS.....	2
A. Consultation and Coordination.....	2
B. Vegetation Cover Type Mapping.....	3
C. Literature Review and Interviews.....	3
D. Target Species.....	4
E. Impact Analysis.....	4
IV. RESULTS AND DISCUSSION.....	5
A. Vegetation Cover Types.....	5
1. Descriptions.....	5
2. Changes resulting from the Willamette projects.....	7
B. Target Species.....	9
1. Wildlife species used for loss assessments	9
2. Changes in habitat value.....	10
3. Impacts of hydroelectric development and operation.....	10
4. Significance of losses.....	11
V. TARGET SPECIES RECOMMENDED FOR MITIGATION, PROTEC- TION, AND ENHANCEMENT.....	11
A. Introduction.....	11
B. Big Game.....	13
1. Roosevelt elk.....	13
2. Black-tailed deer.....	15
C. Furbearers.....	16
1. Beaver.....	16
2. River otter.....	17
D. Upland Game.....	19
1. Ruffed grouse.....	19
2. Band-tailed pigeon.....	19
3. California quail.....	20

TABLE OF CONTENTS  
(Continued)

	<u>Page</u>
E. Nongame.....	21
1. Northern spotted owl.....	21
2. Pileated woodpecker.....	22
3. Bald eagle.....	23
4. Osprey.....	23
F. Waterfowl.....	24
1. Wood duck.....	24
VI. REFERENCES CITED.....	25
APPENDICES.....	33

## I. INTRODUCTION

The wildlife and wildlife habitat loss assessments address the impacts to wildlife resources resulting from the development and operation of the hydroelectric-related components (e.g., dam, reservoir) of the U.S.-Army Corps of Engineers' (USACE) Cougar, Hills Creek, Lookout Point, Dexter, Detroit-Big Cliff, and Green Peter-Foster projects (Willamette projects) (Bedrossian et al. 1985a,b,c,d; Noyes et al. 1985; Potter et al. 1985). The studies were funded by Bonneville Power Administration and were designed to meet requirements of Measure 1004(b)(2) of the Columbia River Basin Fish and Wildlife Program adopted by the Northwest Power Planning Council pursuant to Section 4(h) of the Northwest Electric Power Planning and Conservation Act of 1980.

The objectives of the studies were to: 1) provide for consultation and coordination with interested parties, 2) identify probable effects of past development and operation of the Willamette projects to wildlife and wildlife habitat, and 3) determine the hydroelectric portion of the wildlife resource losses at the Willamette projects. A habitat based approach was used to identify effects of the projects and to determine losses or gains in the potential of the project areas to support wildlife.

## II. STUDY AREA

### A. Project Descriptions

The Willamette projects are located in three major drainages of the Willamette River Basin: the McKenzie, Middle Fork Willamette, and Santiam. Cougar Dam is located at river mile 4.4 of the South Fork McKenzie River. Situated on the Middle Fork Willamette River are Dexter (river mile 18), Lookout Point (river mile 21.3), and Hills Creek (river mile 47.8) dams. Foster Dam is located at river mile 38.5 of the South Santiam River, and upstream from it is Green Peter Dam at river mile 5.5 of the Middle Santiam River. Located on the North Santiam River are Big Cliff (river mile 45.5) and Detroit (river mile 48.5) dams.

Cougar, Hills Creek, Dexter, and Lookout Point reservoirs are located within Lane County. Foster and Green Peter reservoirs are within Linn County, and Detroit and Big Cliff reservoirs are situated along the boundary between Linn and Marion counties.

Cougar, Hills Creek, Lookout Point, Green Peter, and Detroit projects are multiple purpose facilities. Dexter, Foster, and Big Cliff projects are reregulating reservoirs. The Willamette projects have the combined capability to produce 408,000 kilowatts of power.

Construction of the Willamette projects occurred between 1947 and 1969. Detroit-Big Cliff was the first project completed (1954); Green Peter-Foster was the most recent facility put into operation (1969).

## B. Study Area Description

The "affected areas" referred to in the loss assessments were most intensively studied and included the areas directly affected by project construction and operation. The affected areas encompassed the reservoirs, project facilities, staging areas, and relocated roads. Areas not directly affected by the projects, but within the range of species using the project areas, were considered when determining qualitative impacts.

The Willamette projects are located primarily in the Western Hemlock Zone described by Franklin and Dyrness (1973). The reservoir sites were generally characterized by stands of Douglas-fir, western red cedar, and western hemlock. Scattered stands of bigleaf maple and cottonwood occurred along the rivers or lower slopes. Common understory vegetation included red alder, vine maple, Pacific dogwood, willow, rhododendron, Oregon grape, salal, blackberry, fern, and various grasses and forbs. The Dexter and Foster reservoir sites were characterized by the previously mentioned deciduous and understory vegetation cover types interspersed with agricultural lands. More detailed descriptions of vegetation cover types are provided in the loss assessment reports (Bedrossian et al. 1985a,b,c,d; Noyes et al. 1985; Potter et al. 1985).

Black-tailed deer and Roosevelt elk inhabited most of the project sites prior to project construction. Black bear, cougar, bobcat, beaver, river otter, muskrat, mink, marten, raccoon, gray fox, brush rabbit, and skunk also inhabited most of the reservoir areas, as did blue and ruffed grouse, mountain quail, ring-necked pheasant, band-tailed pigeons, mallards, wood ducks, and mergansers. Preconstruction information on nongame species was not documented. In addition to those species documented to be present prior to construction, the affected areas potentially supported many more wildlife species (Appendix A).

## C. Land Ownership

With the exception of Dexter, Foster and Green Peter reservoirs, the Willamette projects are located within the boundaries of the Willamette National Forest of the U.S. Forest Service (USFS). The upper portion of Green Peter Reservoir is within the Salem District of the Bureau of Land Management (BLM); the remainder of Green Peter, most of Big Cliff, and all of Foster and Dexter reservoirs are surrounded by privately owned lands.

## III. METHODS

### A. Consultation and Coordination

A list of agencies and their representatives interested in participating in the consultation/coordination process was developed and updated throughout the studies. Parties on this list received correspondence informing them of the project effort and of consultation/coordination meetings. Participating agencies and individuals were contacted by phone or in person repeatedly throughout the studies. Meeting minutes, draft species lists, target species lists, vegetation cover type

descriptions, acreage tables, habitat rating system descriptions, and sections of the draft reports were provided to those agencies and individuals expressing interest in the loss assessments. Study procedures, species lists, target species, vegetation mapping, and report drafts were discussed at meetings and comments were requested and documented. Interested agencies were represented by participants in the habitat rating process.

## B. Vegetation Cover Type Mapping

Preconstruction, postconstruction, and recent vegetation cover types of the reservoir areas were mapped based on aerial photographs obtained from USACE in Portland, and the University of Oregon map library. Most photographs were black and white, but some recent photographs were color infrared. Scales varied from 1:4,800 to 1:48,000. Base maps, derived from USGS quadrangle maps, were enlarged to 1:24,000 and screened on mylar film. The mapped areas extended 1/4 mile from the full pool reservoir shorelines. Vegetation cover types were based on categories described by Hall et al. (1985), and are described in the loss assessment reports (Bedrossian et al. 1985a,b,c,d; Noyes et al. 1985; Potter et al. 1985).

The aerial photographs were examined under a stereoscope. Areas of discernibly similar vegetation cover were outlined (polygons) and labeled with a symbol designating cover type. These designations were checked against timber type maps obtained from the Willamette National Forest or forest cover type maps obtained from the Salem District of BLM, and photographs taken during site visits. The polygons on the overlays were then transferred to the base map using a camera lucida and proportional dividers to locate each polygon accurately, and by matching known landmarks, slope, and ridge and valley topography.

The recent maps were ground truthed and cover type categories designated on the maps were visually verified. If necessary, changes were made to the draft recent maps, then to postconstruction and preconstruction maps. All maps were then finalized and traced onto mylar overlays to the base maps. Boundaries including only the areas directly affected by each project were determined from analysis of the aerial photographs and vegetation maps and were drawn on the base maps. Acreages of map categories within the affected area boundaries were calculated from blackline reproductions of the maps using the known areas of the reservoirs as a basis for assigning acreages to polygons. A dot grid or digital planimeter was used to calculate acreages.

## C. Literature Review and Interviews

Oregon Department of Fish and Wildlife (ODFW), U.S. Fish and Wildlife Service (USFWS), USFS, and BLM files were examined for wildlife/habitat information relevant to the Willamette projects. An extensive review of journal articles was conducted to locate research findings pertinent to the project areas. Much of the available information on the status of wildlife populations during the preconstruction and postconstruction periods was identified in a status review of wildlife mitigation at Oregon facilities (Bedrossian et al. 1984). Interviews were conducted

with ODFW, USFWS, BLM, and USFS biologists, and other individuals knowledgeable of wildlife/habitat conditions in the project areas.

#### D. Target Species

Wildlife species potentially occurring in the project areas (Appendix A) were identified based on a list of wildlife in the Willamette National Forest (USFS undated), BLM Unit Resource Analysis (BLM 1979), and on the Oregon nongame wildlife management plan review draft (Marshall 1984). From these lists, target species were selected based on factors such as threatened or endangered status, priority according to State or Federal programs, recreational or economic importance, or degree of impacts resulting from the projects. Target species selected represent a cross section of species groups (species that have similar habitat requirements) affected by the Willamette projects and were used to evaluate the losses or gains in the potential of the project areas to support wildlife.

#### E. Impact Analysis

The method used to aid in evaluating the loss or gain of wildlife habitat as a result of the Willamette projects was based on the "Habitat evaluation procedure" developed by USFWS (1976, 1980), "Ecological planning and evaluation procedures" developed by the Joint Federal-State-Private Conservation Organization Committee (1974), and discussions with various USFWS, USACE, and ODFW personnel.

Acres of cover types potentially used within the affected areas were totaled to determine the acres of habitat available to each target species at preconstruction, postconstruction, and recent time periods. Tables summarizing the cover types and acreages available to each target species were compiled. Habitat rating criteria worksheets providing information on habitat requirements were prepared for each target species and are available from ODFW. The worksheets provided a standard from which ratings were based.

Participating agencies designated individuals having expertise in the project areas and/or target species to attend the habitat rating meetings (Appendix B). Each person was provided with habitat rating criteria worksheets, drafts of the background information sections of the loss assessment reports, and tables of cover type acreages. Cover type maps and aerial photos were available and were consulted frequently during the rating sessions. The habitat rating groups toured the project areas, looked at habitat that was similar to that altered by the projects, and discussed preconstruction, postconstruction, and present habitat conditions as well as target species. At the rating sessions, acres of habitat available to each target species were agreed upon, based on cover types, location, and other factors (e.g., forest stand condition) which might indicate whether an area was used as habitat. Once the available habitat was identified, the quality of the habitat at preconstruction, postconstruction, and recent time periods was rated on a scale of 1 to 10 (1=low quality habitat, 5=average quality habitat, 10=optimum habitat) for each target species. Ratings were derived from the site visits, aerial photographs, vegetation maps, habitat



requirements of the target species, and biologists' expertise. Reasons for assigning each rating were documented and are discussed in the reports. Factors other than hydroelectric development and operation that may have influenced the value of the habitats were considered but did not affect the assigned ratings unless otherwise noted in the text of the reports.

The ratings for each target species at each time period were then divided by the optimum habitat value (10) to provide a habitat suitability index. The habitat suitability index was then multiplied by the number of acres of habitat available to that species at that time period to determine habitat units (HU's) available. HU's provide a relative index of the importance of the habitat to that particular species. One HU is equal to one acre of optimum quality or prime habitat for that species.

HU's available to each target species prior to project construction were subtracted from HU's available at postconstruction to determine the loss or gain (as a result of project construction) of the potential of the habitat to meet the requirements of each target species. Preconstruction HU's also were subtracted from recent HU's to determine the loss or gain of the potential of the habitat to support the target species several years after project construction. The number of HU's lost or gained at postconstruction was typically different from the number of HU's lost or gained at the recent time period, and the reason for the difference (such as revegetation of an area that was disturbed during construction) was determined and documented. To simplify the loss assessment and loss/gain accounting process, only the losses or gains at the recent time period were used in the report summaries. The HU's lost or gained represent the change in the potential of the habitat to support the given species at one point in time. That potential, however, was lost or gained over the entire lives of the projects.

When information was available, other factors such as density estimates, impacts not directly affecting habitat quality, and impacts resulting from other causes were analyzed and were discussed in the loss assessment reports. Losses incurred were considered relative to benefits.

#### **IV. RESULTS AND DISCUSSION**

##### **A. Vegetation Cover Types**

###### **1. Descriptions**

Twenty-three cover types were identified at the Willamette projects (Table 1). The most prominent type of vegetation was temperate conifer forest, which was divided into 3 vegetation cover types: pole, saw-timber, and old-growth. Major tree species in all three were Douglas-fir and western hemlock. There were various inclusions of incense cedar, western red cedar, ponderosa pine, bigleaf maple, red alder, madrone, and Oregon white oak, depending on moisture, slope, aspect, elevation, soils, and past disturbance. Crown closure and trunk diameter were the criteria used in distinguishing among the 3 conifer

Table 1. Impacts of USACE Willamette Basin Federal hydroelectric facilities on vegetation cover types (Acres Lost or Gained<sup>a</sup>)

Vegetation Cover Type/ Map Category	McKenzie drainage	Mid-Willamette drainage			Santiam drainage				Total Willamette Basin
	Cougar	Hills Creek	Lookout Point	Dexter	Detroit	Big Cliff	Green Peter	Foster	
Temperate conifer forest, pole				+8	-886	-32	-347	-1	-1,266
Temperate conifer forest, sawtimber	+156 <sup>b</sup>	-231 <sup>b</sup>	-309 <sup>b</sup>	-3 <sup>b</sup>	-410	-103	-621	-8	-1,529
Temperate conifer forest, old-growth	-1,587	-2,694	-724		-177		-2		-5,184
Conifer-hardwood forest	+16	-102	-116	-7	+128	+17	-263	-253	-580
Riparian shrub	+14	-11	-109	-46	-22		-14		-188
Riparian hardwood	-195	-196	-1,009	-399	-578	-20	-159	-104	-2,660
Shrubland	+52	-246	-146	-72	-983	-14	-582	-186	-2,177
Grass-forb	+24	+142	+112	+99	-270	+2	-1,429	+31	-1,289
Red alder	+10		-241	-71	-209	-23	+20	-1	-515
Deciduous hardwood (oak)		+5	-24	+15					-4
Oak savannah				-105					-105
Coniferous wetland		+20							+20
Herbaceous wetland					+7		-12	+2	-3
Agricultural cropland		-122	-713	-281	-22			-423	-1,561
Agricultural pasture		-49	-372	-125	-23		-188	-58	-815
Agricultural orchard			-94						-94
Sand/gravel/cobble	-34	-71	-219	-176	-50		-32	-50	-632
Rocky cliffs/talus							+3		+3
Disturbed/bare/rock	+345	+481	+165	-167	+71	+104	+272	+68	+1,673
Residential/urban/industrial		-4	-21	+106	+154		-45	-53	+145
Ponds							+7		+7
River	-71	-119	-442	-135	-310	-72	-213	-159	-1,521
Reservoir	+1,280	+2,710	+4,255	+1,025	+3,580	+141	+3,605	+1,195	+17,791

<sup>a</sup> From preconstruction to recent conditions.

<sup>b</sup> Includes some pole-sized trees also.

types. Conifer-hardwood stands were mixtures of hardwoods and conifers. Red alder was the most common hardwood species in this cover type, which also included bigleaf maple and madrone.

Riparian shrub areas occurred along the banks of the rivers and on sand and gravel bars, and were characterized by seedling willows, red alder, and black cottonwood, with scattered forbs. Riparian hardwood stands contained black cottonwood, bigleaf maple, and other deciduous species, as well as conifers.

The shrubland vegetation cover type was often dominated by seedling conifers and appeared to be a seral stage in regeneration of the temperate conifer forest. In most cases, the grass-forb cover type was the first stage of revegetation of clearcuts or disturbed areas and tree seedlings were usually present.

Stands dominated by red alder were distinguished from riparian hardwoods by their location in relation to the river or by topography. The deciduous hardwood (oak) vegetation cover type was dominated by Oregon white oak. Oak savannah was characterized by grassland with scattered stands of Oregon white oak sometimes accompanied by Douglas-fir.

Western red cedar was the dominant tree in the coniferous wetland cover type, with salmonberry and red osier dogwood in the understory, and cattail and large grasses in the channels. Herbaceous wetlands appeared to be wet or subirrigated meadows, probably dominated by sedges, rushes, and grasses.

Agricultural cropland, orchard, and pasture were characterized by evidence of some regular cultivation, fences, and/or regular shapes. Sand/gravel/cobble areas occurred along the river and were probably under water during spring runoff and other periods of high water. Rocky cliffs/talus generally occurred where seasonal runoff cut into the hill-sides leaving vegetation-free paths, or where wave action caused slumping of steep banks. Disturbed/bare/rock included naturally barren areas as well as areas where severe or continued disturbance prevented the reestablishment of vegetation. Residential/urban/industrial areas included rural residences and outbuildings, towns, and industrial areas such as sawmills or scaling stations.

Industrial ponds, ponds resulting from road relocation, and a former fish hatchery site were mapped as ponds. The river map category included only the main river channels, since the tributaries were too narrow to map. The reservoir areas included the full pool level. Fluctuating water levels at most of the Willamette projects were not conducive to the establishment of vegetation, and the drawdown zones were, therefore, generally barren of vegetation.

## 2. Changes resulting from the Willamette projects

The Willamette projects inundated, extensively altered, or affected 33,407 acres of land and river in the McKenzie, Middle Fork Willamette, and Santiam river drainages. Approximately 17,800 acres, 60 miles of river, and an undetermined number of miles of tributary streams were

Table 2. Impacts of USACE Willamette Basin Federal hydroelectric facilities on loss assessment target species  
(Habitat value (HU's) lost or gained)

TARGET SPECIES	McKenzie drainage		Mid-Willamette drainage			Santiam drainage			Total Willamette Basin
	Cougar	Hills Creek	Lookout Point	Dexter	Detroit	Big Cliff	Green Peter	Foster	
<u>Big Game</u>									
Black-tailed deer	-1,192	-2,912	-4,043	-1,078	-3,061	-81	-3,997	-890	-17,254
Roosevelt elk	-1,484	-3,203	-3,668		-2,210	-81	-3,997	-652	-15,295
Black bear	-1,856	-2,958	a						-4,814
Cougar	-1,472	-2,381							-3,853
<u>Furbearers</u>									
Beaver	-189	-326	-1,739	-832	-715	-50	-381	-245	-4,477
River otter	-189	-384			-882	-38	-575	-340	-2,408
Mink			-1,586	-832					-2,418
Red fox			-2,082	-508					-2,590
<u>Upland Game</u>									
Ruffed grouse	-293	-468	-2,457	-701	-3,028	-81	-3,264	-853	-11,145
California quail			-1,937	-664				-385	-2,986
Ring-necked pheasant			-1,654	-332					-1,986
Band-tailed pigeon							-3,487		-3,487
Western gray squirrel			-1,070	-284					-1,354
<u>Waterfowl</u>									
Harlequin duck	-282	-269							-551
Wood duck			-1,124	-644				-179	-1,947
Common merganser			-95		+1,169	-11	-21		+1,042
Greater scaup				+820					+820
Waterfowl <sup>b</sup>	+100 <sup>c</sup>	+323							+423
<u>Nongame</u>									
Bald Eagle	+345	+486	+1,497	+168	+648	+20	+2,128	+401	+5,693
Osprey	+185	+44	+1,139	+226	+1,416	+20	+2,614	+525	+6,169
Spotted owl	-1,774	-2,977	-714		-246				-5,711
Pileated woodpecker	-1,938	-3,201	-1,614		-1,156	-71	-710		-8,690
American dipper	-285	-200	-350	-119					-954
Yellow warbler	-170	-210	-1,321	-654					-2,355

<sup>a</sup> Blank indicates species was not used as a target species at that project.

<sup>b</sup> Includes Barrow's and common goldeneye, bufflehead, and common merganser.

<sup>c</sup> Evaluation team determined net gain did not actually occur at Cougar Reservoir for waterfowl.

inundated. Surrounding land was altered by relocated roads, project facilities, and construction activities.

Vegetation cover types impacted by the Willamette projects are shown in Table 1. The largest loss of wildlife habitat incurred by the Willamette projects was 5,184 acres of old-growth conifer forest. Old-growth forests in the Pacific Northwest support diverse and abundant wildlife populations and provide optimum habitat for up to 18 bird and mammal species (Meslow et al. 1981). The reduction of old-growth stands in the Pacific Northwest is of serious concern to wildlife managers.

Approximately 2,850 acres of riparian hardwood stands and riparian shrubs were eliminated within the areas directly affected by the Willamette projects. Riparian vegetation associated with rivers and streams is also considered to be of importance by wildlife managers. Riparian habitat is generally thought to provide for higher density and diversity of wildlife than most other habitats.

Losses of wildlife habitat also included 1,266 acres of pole-sized conifer forest and 1,529 acres of sawtimber (Table 1). Approximately 2,180 acres of shrubland and 1,290 acres of grass-forb vegetation cover types were inundated by the Willamette projects. Other losses of wildlife habitat included conifer-hardwood forest, red alder stands, deciduous hardwoods and oak savannah, as well as herbaceous wetlands, agricultural lands, sand/gravel/cobble, and river channels.

Cover types which increased within the Willamette projects affected areas included the reservoir, ponds, disturbed/bare/rock, rocky cliffs/talus, coniferous wetlands, and residential/urban/industrial categories (Table 1).

To simplify the summary of impacts resulting from construction of the Willamette projects, only losses and gains which occurred from the preconstruction to more recent (1979) conditions were addressed. In most cases, losses in acres of vegetation cover types were greater immediately following construction of the projects than when measured several years after completion of the projects. Natural revegetation in the portions of the affected areas which were not inundated increased available wildlife habitat at the projects between the postconstruction and recent periods.

## B. Target Species

### 1. Wildlife species used for loss assessments

Twenty-four wildlife species or species groups were selected as target species for the loss assessments (Table 2). These species or species groups were chosen based on the criteria presented in Section III. D. Black-tailed deer, beaver, ruffed grouse, bald eagle, and osprey were used as target species at all of the Willamette projects. The remaining target species were selected for one or more, but not each, of the projects. Because all 24 target species were not used at every project, the total impacts in the Willamette Basin shown in Table 2 are an incomplete summation of habitat losses or gains for the target species at the 8 USACE facilities.

## 2. Changes in habitat values

The losses or gains in HU's for the target species resulting from construction and operation of the Willamette projects are displayed in Table 2. Each species was evaluated separately.

The target species that lost the most HU's at all 8 Willamette projects was the black-tailed deer (-17,254 HU's). Ruffed grouse lost a total of 11,145 HU's at all the projects, Roosevelt elk lost 15,295 HU's at 7 projects, and pileated woodpeckers lost 8,690 HU's at 6 of the 8 projects. Other target species that lost HU's as a result of the Willamette projects included black bear, cougar, river otter, mink, red fox, California quail, ring-necked pheasant, band-tailed pigeon, western gray squirrel, harlequin duck, wood duck, northern spotted owl, American dipper, and yellow warbler.

Bald eagles (+5,693 HU's) and ospreys (+6,169 HU's) gained HU's at all 8 projects, primarily because of increases in foraging habitat. Common mergansers and greater scaup also gained foraging habitat and HU's.

In most cases it was not practical or possible to estimate the number of animals lost or gained as a result of the Willamette projects because site-specific wildlife population estimates prior to construction were not available. Attempts to estimate the number of animals lost or gained at the Willamette projects is further complicated by the considerable change in conditions for wildlife in the Willamette Basin caused by timber harvesting and increased human use. The potential of the affected areas to support wildlife, quantified in HU's, was altered as a result of the Willamette projects. The HU's lost or gained (Table 2) represent the change in the potential of the habitat to support the given species at one point in time; however, that potential was lost over the entire life of the project.

For some target species, the loss of HU's exceeded the direct loss of acres of habitat due to the Willamette projects. This was a result of the loss of acreage in addition to the degradation in the quality of the remaining habitat.

## 3. Impacts of hydroelectric development and operation

Approximately 33,400 acres of land and river were inundated, altered, or affected by the Willamette projects. Lands surrounding the projects were altered by relocated roads, project facilities, and construction activities.

Extreme water level fluctuations at most of the Willamette projects have precluded revegetation of the reservoir shorelines. This has resulted in a lack of escape cover and/or nesting, feeding, and resting habitat adjacent to the reservoirs. The reservoir shorelines are moderately to very steep, which limits use by wildlife. Wildlife habitat remaining within the affected areas above full pool level is often in narrow strips, or in small, isolated pockets.

Preconstruction vegetation diversity was lost due to inundation by the Willamette projects, as was an undetermined number of acres of wildlife habitat in the tributary streams. In addition to the loss of wildlife habitat, road use and recreational disturbance have degraded the suitability of the habitat remaining in the affected areas. An increase in foraging area occurred at the Willamette projects for bald eagles, ospreys, and some waterfowl species.

The quantitative impacts considered in the loss assessment reports were limited to the areas directly affected by the Willamette projects. The impacts to wildlife and wildlife habitat would have occurred even if the project was not used for flood control or other non-hydroelectric purposes.

#### 4. Significance of losses

Construction and operation of the Willamette projects resulted in the loss of winter range for Roosevelt elk, and the loss of year-round habitat for black-tailed deer, black bear, cougar, beaver, river otter, mink, red fox, ruffed grouse, California quail, ring-necked pheasant, band-tailed pigeon, western gray squirrel, harlequin duck, wood duck, spotted owl, pileated woodpecker, American dipper, yellow warbler, and many other wildlife species. Important winter range for deer and elk, critical for survival during severe winter conditions, was located along the preconstruction river bottomlands. In addition, the Willamette projects blocked migration routes, hindered dispersal, and/or inhibited wildlife movement in the affected river drainages. Among the types of wildlife habitat lost as a result of the Willamette projects were old-growth conifer forest and riparian habitat, both of which are extremely important to wildlife in western Oregon.

Cumulative or systemwide impacts of the Willamette projects were not quantitatively assessed. Losses of wildlife and wildlife habitat resulting from increased human development as a result of the Willamette projects were not addressed. Indirect impacts such as degradation of habitat adjacent to the project sites as a result of increased human development, recreational use, or blockage of anadromous fish passage were not measured.

### V. TARGET SPECIES RECOMMENDED FOR MITIGATION, PROTECTION, AND ENHANCEMENT

#### A. Introduction

Of the 24 target species used in the loss assessment reports for the Willamette projects, 12 are recommended as target species for mitigation, protection, and enhancement (Table 3). These species were recommended because of threatened or endangered status, priority according to State or Federal programs, recreational or economic importance, degree of impacts resulting from the Willamette projects, or to represent other wildlife species with similar habitat preferences or requirements.

Table 3. Target species recommended for mitigation, protection, and enhancement, and rationale for selection, Willamette Basin, Oregon.

---

Big Game

Black-tailed deer - ODFW management emphasis, loss of year-round habitat and winter range.

Roosevelt elk - ODFW management emphasis, loss of winter range, and alteration of migration routes.

Furbearers

Beaver - economic importance, loss of river and riparian habitat.

River otter - economic importance, loss of river and riparian habitat.

Upland Game

Ruffed grouse - represents forest upland game birds, loss of riparian habitat, recreational importance.

Band-tailed pigeon - loss of conifer forest and mineral springs, recreational importance.

California quail - recreational importance, loss of agricultural habitat.

Nongame

Pileated woodpecker - indicator for cavity-nesting birds, loss of mature conifer forest.

Spotted owl - threatened species, loss of old-growth conifer forest.

Bald eagle - threatened species, may have benefitted from project, good potential for habitat improvement in project areas.

Osprey - species of special interest (USFWS), may have benefitted from project, good potential for habitat improvement in project areas.

Waterfowl

Wood duck - species of special emphasis (USFWS), recreational importance, loss of river bottomland habitat.



## B. Big Game

Black-tailed deer lost 17,254 HU's and Roosevelt elk lost 15,295 HU's as a result of construction and operation of the Willamette projects (Table 2). The value of the project sites to deer and elk is detailed in the loss assessment reports (Bedrossian et al. 1985a,b,c,d; Noyes et al. 1985; Potter et al. 1985). The reports indicate Cougar Reservoir eliminated a "significant amount of the available winter range for big game" (USACE 1979); the loss of habitat at Hills Creek was "particularly significant because it was winter range for both black-tailed deer and Roosevelt elk" (USACE and USFS 1968); the Green Peter site provided 40% of the critical winter range during severe winters (USFWS 1961).

### 1. Roosevelt elk

#### (a) Rationale for selection

The Roosevelt elk is recommended as a target species because of ODFW management emphasis, loss of winter range, need for improved and increased winter range, alteration of migration routes due to construction and operation of the Willamette projects, and to represent other wildlife species with similar habitat requirements.

Roosevelt elk are a major big game species in western Oregon. Approximately 51,200 hunters participated in seasons for Roosevelt elk in 1983, and over 43,000 hunter-days of recreation were provided in the Indigo, McKenzie, and Santiam wildlife management units that same year (Ingram 1984).

#### (b) Needs within the project areas

Roosevelt elk lost valuable winter range as a result of the Willamette projects. More specifically, critical winter survival habitat was inundated (Bedrossian et al. 1985a,b,c,d; Noyes et al. 1985; Potter et al. 1985). Deer and elk winter range on the west slope Cascade Range is limited (B. Cleary, J. Greer, P. Ingram, ODFW, pers. commun.), therefore, there is a need for improved and increased elk winter range in the project areas.

#### (c) Management goals

Elk were reported to inhabit almost every valley and mountain range of western Oregon in the early 1800's, including the west slope of the Cascades (Shay 1985), but settlement and unrestricted hunting had decimated the elk population by 1900 (Mace 1956). The availability of productive clear-cut habitat on federally owned lands of the west slope Cascades and increasing interest in elk hunting precipitated ODFW's Roosevelt elk trapping and transplant program (Mace 1971). Roosevelt elk transplants by ODFW date back to 1947 (Harper 1982). Because elk do not migrate any distance to occupy new habitat, trapping and transplanting is the only way to stock suitable habitat isolated from established herds (Mace 1971). With this in mind, ODFW has a goal to maintain a Roosevelt elk population in the Cascade and Coast Ranges of 96,000 animals by transplanting elk to all suitable unoccupied habitat

(Eastman 1980, pers. commun.; ODFW undated). ODFW developed benchmark population goals for Roosevelt elk which have not been officially adopted by the Fish and Wildlife Commission, but which are used by ODFW as management goals for planning purposes. The following benchmark populations have been developed for the wildlife management units in which the Willamette projects are located (ODFW files):

Management Unit or Sub Unit	Wintering Elk		Summer Adults		Elk per mile	
	1985	Benchmark	1985	Benchmark	1985	Benchmark
McKenzie	2,500	4,500	2,500	3,750	4.2	7.5
South Santiam	2,800	5,900	2,800	5,900	---	---

In addition to establishing habitat protection guidelines for riparian zones, streamside buffer strips, natural openings, wetlands, and old-growth coniferous forest, ODFW has also developed deer and elk cover: forage ratio guidelines (ODFW 1983a, 1985). Deer and elk summer and winter ranges should consist of 50% well-distributed thermal cover, at least 25% of which is optimal (trees >21 inches dbh for maximum snow intercept capability), and 20% forage areas (ODFW 1985). Specific to the west slope Cascades, optimal winter range thermal cover on each major drainage should extend 1/4 mile on each side of the stream. Forage areas should not exceed 10 acres in size and should be well-distributed (ODFW 1985).

USFS regulations require that fish and wildlife habitat be managed to maintain viable populations of existing species in the planning area. To accomplish this, habitat must be provided to support at least a minimum number of reproductive individuals, and this habitat must be well-distributed so that those individuals can interact with others in the planning area (Sirmon 1984). Benchmark deer and elk populations for the Willamette National Forest are being developed in the land management plan. The existing Roosevelt elk population is approximately 6,600 animals (Skeesick 1985). The optimum population is 8,400 elk, and the maximum sustainable population of Roosevelt elk in the Willamette National Forest is approximately 12,000 animals (Skeesick 1985).

BLM has identified a population goal of 293 elk in the Santiam planning unit (BLM 1979). The estimated 1979 elk population in the planning unit was 99 animals, 34% of the population goal (BLM 1979). Elk populations are increasing in the planning area, but severe winter weather occasionally causes elk declines in some areas (BLM 1979). BLM has no areas of the Eastside Salem Unit withdrawn specifically for the management of Roosevelt elk (BLM 1979); however, it does have deer and elk habitat guidelines. BLM will manage for a habitat composition of 20% foraging area, 30% escape cover, and 50% thermal cover within each section of BLM land (BLM 1979). BLM will also manage for trees at least 7 inches dbh in minimum densities of 250 stems per acre within deer and elk winter range, and manage for at least 60% crown cover in

forests older than 45 years (BLM 1979). A visual screen along roadways of at least 1 sight distance (the distance necessary to hide 90% of a large animal from view in a given cover type [Thomas 1979]) will be maintained to reduce human disturbance of foraging areas (BLM 1979).

## 2. Black-tailed deer

### (a) Rationale for selection

The black-tailed deer is recommended as a target species because of ODFW management emphasis, loss of year-round habitat and critical winter range due to construction and operation of the Willamette projects, need for improved and increased winter range, and to represent other wildlife species with similar habitat requirements.

Black-tailed deer are pursued by more hunters than any other big game species in western Oregon. Deer hunting provided over 267,000 hunter-days of recreation in the Indigo, McKenzie, and Santiam wildlife management units during 1983 (Ingram 1984).

Black-tailed deer are a major big game species in Oregon and have different specific habitat requirements and preferences than elk. Therefore, black-tailed deer are recommended as a target species in addition to Roosevelt elk, even though many basic habitat requirements are similar.

### (b) Needs within the project areas

Black-tailed deer lost valuable winter range as a result of the Willamette projects. More specifically, critical winter survival habitat was inundated (Bedrossian et al. 1985a,b,c,d; Noyes et al. 1985; Potter et al. 1985). Deer and elk winter range on the west slope Cascade Range is limited (B. Cleary, J. Greer, P. Ingram, ODFW, pers. commun.), therefore, there is a need for improved and increased deer winter range in the project areas.

### (c) Management goals

ODFW has a goal to maintain a statewide population of 498,000 black-tailed deer (Eastman 1980, pers. commun.). Benchmark population goals for black-tailed deer have been developed by ODFW. These benchmark figures have not been officially adopted by the Fish and Wildlife Commission, but are used by ODFW for planning purposes. The wintering deer and summer adult populations of 27,900 in the McKenzie wildlife management unit are below the benchmark of 37,000 wintering deer and summer adults (ODFW files). Current deer populations in the southern portion of the Santiam unit meet or exceed benchmark goals (ODFW files).

In addition to establishing habitat protection guidelines for riparian zones, streamside buffer strips, natural openings, wetlands, and old-growth coniferous forest, ODFW has also developed deer and elk cover: forage ratio guidelines (ODFW 1983a, 1985). Deer and elk summer and winter ranges should consist of 50% well-distributed thermal cover, at least 25% of which is optimal (trees >21 inches dbh for maximum snow

intercept capability), and 20% forage areas (ODFW 1985). Specific to the west slope Cascades, optimal winter range thermal cover on each major drainage should extend 1/4 mile on each side of the stream. Forage areas should not exceed 10 acres in size and should be well-distributed (ODFW 1985).

USFS regulations require that fish and wildlife habitat be managed to maintain viable populations of existing species in the planning area. To accomplish this, habitat must be provided to support at least a minimum number of reproductive individuals, and this habitat must be well-distributed so that those individuals can interact with others in the planning area (Sirmon 1984). The existing deer population in the Willamette National Forest is 34,500 animals (Skeesick 1985). The optimum level is approximately 30,400 deer, and maximum sustainable level within the Willamette National Forest is about 36,000 deer (Skeesick 1985).

BLM has identified a population goal of 2,437 deer in the Santiam planning unit (BLM 1979). The estimated 1979 deer population in the planning unit was 1,546 animals, 63% of the population goal (BLM 1979). BLM has no areas of the Eastside Salem Unit withdrawn specifically for the management of black-tailed deer (BLM 1979); however, it does have deer and elk habitat guidelines. BLM will manage for a habitat composition of 20% foraging area, 30% escape cover, and 50% thermal cover within each section of BLM land (BLM 1979). BLM will also manage for trees at least 7 inches dbh in minimum densities of 250 stems per acre within deer and elk winter range, and manage for at least 60% crown cover in forests older than 45 years (BLM 1979). A visual screen along roadways of at least 1 sight distance will be maintained to reduce human disturbance of feeding areas (BLM 1979).

### C. Furbearers

Beaver lost 6,885 HU's and river otter lost 2,408 HU's as a result of construction and operation of the Willamette projects (Table 2). The value of the project sites to beaver and otter is detailed in the loss assessment reports. The primary impact of the Willamette projects was the loss of riparian hardwoods, the major source of food for beaver and cover for river otter (Bedrossian et al. 1985a,b,c,d; Noyes et al. 1985; Potter et al. 1985).

#### 1. Beaver

##### (a) Rationale for selection

The beaver is recommended as a target species because of economic importance, loss of river and riparian habitat due to the Willamette projects, and to represent other wildlife species with similar habitat requirements.

(b) Needs within the project areas

Beaver are dependent upon relatively stable water sources and associated riparian habitat for survival. Riparian habitats are the major feeding areas for beaver. Water level fluctuations at the Willamette projects have precluded revegetation of the reservoir shorelines; therefore, riparian hardwoods are not returning to preconstruction abundance. Beaver denning sites remaining within the affected areas are not used because of changing water levels. The Willamette projects probably inhibited beaver movement along the rivers. Riparian hardwoods and suitable denning sites for beaver are lacking within the areas impacted by the Willamette projects.

(c) Management goals

It is the policy of ODFW to manage furbearers in a manner compatible with other wildlife species and the habitat, and to achieve the highest sustained use of the resource as a commercial crop. In addition, ODFW will manage the beaver resource to utilize the species to a maximum degree in soil and water conservation and at the same time, maintain numbers compatible with other resources (ODFW 1983b).

ODFW has acknowledged riparian habitat as extremely important to fish and wildlife, and identified it as one of the most critical areas needing multiple-use planning (ODFW 1983a). ODFW guidelines indicate management plans should include provisions for protecting the integrity of riparian habitat and restoring degraded habitat (ODFW 1983a). In areas where management activities have degraded riparian habitat, natural recovery should be enhanced to restore the productivity of this habitat (ODFW 1983a).

BLM has identified a goal to maintain beaver at their present population level in the Santiam planning unit, which in 1979 was estimated at 79 beavers (BLM 1979). BLM has no areas of the Eastside Salem Unit withdrawn specifically for the management of beaver; however, it does consider riparian areas and ponds important use areas due to their value as foraging, cover, and rearing areas (BLM 1979).

USFS regulations require that fish and wildlife habitat be managed to maintain viable populations of existing species in the planning area. To accomplish this, habitat must be provided to support at least a minimum number of reproductive individuals, and this habitat must be well-distributed so that those individuals can interact with others in the planning area (Sirmon 1984).

2. River otter

(a) Rationale for selection

The river otter is recommended as a target species because of economic importance, loss of river and riparian habitat due to the Willamette projects, and to represent other wildlife species with similar habitat requirements.

(b) Needs within the project areas

River otters require a permanent source of water and adjacent riparian habitat for hunting, cover, and denning. Exposed reservoir shorelines at the Willamette projects do not provide adequate cover or denning sites for river otters. An Idaho study indicated Cascade Reservoir was virtually unused by river otters despite a sufficient food source because there were inadequate escape cover and resting sites along the exposed shoreline (Melquist and Hornocker 1983). The study also indicated that otters' tolerance of human activity was related to the amount of escape cover and shelter along a lake shoreline. The Idaho study concluded that otters preferred stream-related habitats to lakes, reservoirs, and ponds because of the availability of shelter and escape cover and reduced disturbance.

The Willamette project areas lack preferred stream habitat, denning sites, and adequate escape cover for river otters. The normal foraging and dispersal movement of river otters along stream corridors has been inhibited by the projects.

(c) Management goals

It is the policy of ODFW to manage furbearers in a manner compatible with other wildlife species and the habitat, and to achieve the highest sustained use of the resource as a commercial crop (ODFW 1983b). ODFW has acknowledged riparian habitat as extremely important to fish and wildlife. ODFW guidelines indicate management plans should include provisions for protecting the integrity of riparian habitat and restoring degraded habitat (ODFW 1983a). ODFW also has guidelines regarding streamside buffers, which are designed to provide shade for 75% of the water surface of a stream to protect fish habitat (ODFW 1983a). Not only do the streamside buffers benefit fish, the river otter's primary prey, but they also benefit terrestrial wildlife. Streamside buffer zones for wildlife should be wide enough and dense enough with natural undergrowth to provide protected travel routes for larger mammals, and contain mature trees and snags to provide habitat diversity (ODFW 1983a).

BLM has identified a goal to maintain river otters at their present population level in the Santiam planning unit, which was considered "moderate" in 1979 (BLM 1979). BLM has no areas of the Eastside Salem Unit withdrawn specifically for the management of river otters; however, it does consider riparian areas important use areas due to their value as foraging, cover, and rearing areas (BLM 1979).

USFS regulations require that fish and wildlife habitat be managed to maintain viable populations of existing species in the planning area. To accomplish this, habitat must be provided to support at least a minimum number of reproductive individuals, and this habitat must be well-distributed so that those individuals can interact with others in the planning area (Sirmon 1984).

#### D. Upland game

Upland game birds potentially affected by construction of the Willamette projects included ruffed grouse, blue grouse, mountain quail, California quail, ring-necked pheasant, and band-tailed pigeon. The value of the project sites to upland game birds is detailed in the loss assessment reports (Bedrossian et al. 1985a,b,c,d; Noyes et al. 1985; Potter et al. 1985).

##### 1. Ruffed grouse

###### (a) Rationale for selection

The ruffed grouse is recommended as a target species because of recreational value, habitat losses which occurred as a result of the projects, and to represent other wildlife species with similar habitat requirements.

###### (b) Needs within the project areas

Ruffed grouse lost a combined total of 11,145 HU's at all projects (Table 2). Greatest losses occurred at the Green Peter, Detroit, and Lookout Point sites; consequently, protection, mitigation, and enhancement needs are greatest at those project areas.

###### (c) Management goals

Specific management goals for ruffed grouse populations in Oregon do not exist. Riparian habitat used by ruffed grouse, however, is recognized as providing for higher wildlife density and diversity than other habitats and, as such, is a habitat of special concern. ODFW recommends "restoration of degraded riparian habitat to at least 80 percent of potential..." (ODFW 1985). The BLM Manual states it is BLM policy to "give full consideration to maintaining habitat diversity for all wildlife and fish species with special emphasis on management of wetland and riparian areas." (BLM cited in Marshall 1984).

##### 2. Band-tailed pigeon

###### (a) Rationale for selection

The band-tailed pigeon is a migrant species that nests in Oregon. Band-tails are associated with coniferous forests in western Oregon and display a special need for minerals obtained from springs and tidal flats. Mineral springs have been identified as wildlife habitat of special concern (ODFW 1983a). The band-tailed pigeon is an important game species; over 88,000 birds were harvested in 1981 (ODFW files). The band-tailed pigeon is recommended as a target species because of recreational value, dependence on mineral springs, and loss of habitat resulting from the Willamette projects.

(b) Needs within the project areas

Band-tailed pigeons lost a minimum of 3,487 HU's at the project sites (Table 2). Bandtails were used as a loss assessment target species only at Green Peter, yet many acres of conifer forest were lost at other projects also (Table 1). The Green Peter Project inundated a mineral spring near Tally Creek that was extensively used by band-tailed pigeons (N. TenEyck, H. Sturgis, ODFW, pers. commun.).

(c) Management goals

Specific management goals for band-tailed pigeon populations in Oregon are not available. Objectives of the Pacific Flyway management plan for the Pacific Coast band-tailed pigeon include increasing the population level such that it will safely sustain annual recreational harvests of approximately 450,000 pigeons (USFWS 1983). ODFW lists band-tailed pigeon springs as sensitive areas and recommends that wildlife needs in these areas receive priority (ODFW 1983a). ODFW has developed guidelines for the protection of pigeon springs (ODFW files).

3. California quail

(a) Rationale for selection

The California quail is recommended as a target species because of recreational importance, loss of agricultural habitat due to the Willamette projects, and to represent other wildlife species with similar habitat requirements.

(b) Needs within the project areas

California quail are typically associated with cultivated lands. The Willamette projects inundated over 2,400 acres of agricultural cropland, pasture, and orchard (Table 1). Quail habitat remaining within the affected areas above full pool is often in narrow strips or isolated pockets, and lacks the vegetation diversity of preconstruction conditions. In order to mitigate for the loss of 2,986 HU's for California quail, there is a need to protect existing suitable habitat in the project areas, or to enhance quail habitat elsewhere in the Willamette Basin.

(c) Management goals

In the mid-1970's, ODFW's upland game management objective was to maintain the maximum number of birds compatible with other land uses (Masson and Mace 1974). Specific management goals have not been established for Oregon. ODFW recognizes the importance of habitat diversity to provide the needs of many species of wildlife, and recommends habitat diversity be provided for in land use plans (ODFW 1983a).



## E. Nongame

Impacts to northern spotted owls and pileated woodpeckers centered around the loss of old-growth conifer forest at the Willamette projects. Foraging habitat for bald eagles and ospreys increased due to the projects. The value of the project sites to nongame wildlife is detailed in the loss assessment reports (Bedrossian et al. 1985a,b,c,d; Noyes et al. 1985; Potter et al. 1985).

### 1. Northern spotted owl

#### (a) Rationale for selection

The northern spotted owl is currently classified by ODFW as "threatened" in Oregon. The spotted owl is frequently used as an indicator species because it is sensitive to land use actions affecting old-growth forests and can be used to predict the suitability of a habitat area for a variety of species having similar habitat requirements. The spotted owl is recommended as a target species because of its threatened status, to represent the group of species which find optimum habitat in old-growth forests, and because of the loss of critical old-growth forest habitat resulting from the Willamette projects.

#### (b) Needs within the project areas

Northern spotted owl populations in Oregon appear to be declining as old-growth conifer forests are gradually eliminated (Forsman et al. 1985). Over 5,000 acres of old-growth and approximately 1,500 acres of sawtimber conifer forest were lost as a result of the Willamette projects (Table 1). Most of the losses in old-growth forest occurred at the Cougar and Hills Creek sites. Because northern spotted owls depend on old-growth forests to fulfill many nesting and foraging requirements, there is a need to protect or replace those areas to prevent a further decline in spotted owl populations. In addition, old-growth forests support diverse and abundant wildlife populations and provide optimum habitat for up to 18 bird and mammal species (Meslow et al. 1981).

#### (c) Management goals

A management plan for the spotted owl in Oregon is being developed by the Oregon-Washington Interagency Wildlife Committee (O-WIWC). This management plan recommended managing enough old-growth habitat to support 400 pairs of spotted owls on Federal and State lands. The committee emphasized that the primary criterion for selection of management sites should be maintaining an even geographic distribution of pairs on forest lands. Recommendations for spotted owl management areas (SOMA's) include retaining a minimum of 300 acres of old-growth forest around the nest area and an additional 700 acres of old-growth, or the oldest available forest, within 1.5 miles of the nest site. Currently designated SOMA's within 1-2 miles of the project areas include 2 at Cougar, 2 at Hills Creek, 3 at Lookout Point, 1 at Green Peter, and 2 at Detroit.

Because old-growth forests are important to a wide variety of wildlife, ODFW recommends that 5-15% of the managed forest be maintained in old-growth status (ODFW 1983a). The U.S. Forest Service Operations Manual includes a wildlife and fish habitat management objective to "give special attention to the environmental needs of threatened and endangered animal and plant species, and establish as a goal their removal, where possible, from such status by improving, protecting, and managing their habitats" (USFS cited in Marshall 1984). The BLM Manual states it is BLM policy to "design habitat improvements and other management actions to protect threatened, endangered, and sensitive species and their habitats" (BLM cited in Marshall 1984). The U.S. Fish and Wildlife Service is presently developing a plan for spotted owls as a national species of special emphasis (P. Wright, USFWS, pers. commun.).

## 2. Pileated woodpecker

### (a) Rationale for selection

The pileated woodpecker is a primary cavity excavator and is frequently used as an indicator species for wildlife using large sawtimber and old-growth forest habitat. Vacated woodpecker cavities are used by many birds and mammals for reproduction, roosting, shelter, or hibernation (Bull and Meslow 1977). The pileated woodpecker is recommended as a target species because of its preference for and loss of old-growth and mature forest habitat, and to represent species with similar habitat requirements.

### (b) Needs within the project areas

Pileated woodpeckers lost a combined total of 8,690 HUs at 6 projects (Table 2). Greatest losses among the approximate 5,180 acres of old-growth conifer forest, 1,500 acres of sawtimber conifer forest, and 2,660 acres of riparian hardwoods occurred at the Hills Creek, Cougar, Lookout Point, and Detroit sites. Mitigation, protection, and enhancement needs, consequently, are greatest at those project areas.

### (c) Management goals

ODFW criteria for areas managed for old-growth conifer forest, old-growth species, and cavity-dwelling species include providing sufficient habitat to maintain cavity-dwelling species at 100% of the population potential (ODFW 1985). On other forest areas, habitat should be provided to maintain cavity-dwelling species above 60% of the population potential. To support 100% of maximum populations, 6 snags larger than 25 inches dbh are needed per 100 acres to fulfill nesting requirements (Neitro et al. 1985). The BLM Manual states it is BLM policy to "maintain habitat for viable, self-sustaining populations of cavity-nesting and snag-dependent wildlife species. This shall include the retention of selected trees, snags, and creation of new cavities, as well as selection of old-growth stands to meet habitat needs of wildlife dependent upon old-growth stands" (BLM cited in Marshall 1984).

### 3. Bald eagle

#### (a) Rationale for selection

The bald eagle is classified by ODFW and USFWS as "threatened" in Oregon. The bald eagle is recommended as a target species because of its threatened status, and because of the potential for habitat improvement in the project areas.

#### (b) Needs within the project areas

Bald eagle needs in the project areas involve protection and enhancement of existing and potential habitat to aid in meeting recovery goals for delisting the species. Nesting, roosting, and perching habitats are more likely to be impacted by forestry-related activities than are foraging habitats and, thus, may have more immediate protection needs. Protection and management are necessary for currently occupied bald eagle habitat, plus areas representing potential nesting habitat. The Pacific States Bald Eagle Recovery Team (PSBERT) defined "key areas" as those habitats currently supporting breeding or wintering populations of eagles, and identified key areas at Lookout Point and Hills Creek (PSBERT 1984). Potential nesting areas were designated at Detroit, Foster, Green Peter, Cougar, and Dexter.

#### (c) Management goals

A draft recovery plan for the Pacific bald eagle population has been prepared by representatives from several State and Federal agencies. The plan identifies for Oregon a habitat/population goal to maintain 309 bald eagle territories and 210 breeding pairs (PSBERT 1984). Within the Willamette/Umpqua Basins Zone, 5 existing territories and 45 potential territories were identified. The habitat management goal is 45 territories, and the population goal is to increase the current 5 pairs of bald eagles to 30 pairs (PSBERT 1984). Management plans for specific sites have also been developed. The goal of the Hills Creek Reservoir Bald Eagle Management Plan (Nichols 1983) is to provide habitat for 3 nesting pairs and numerous wintering bald eagles.

### 4. Osprey

#### (a) Rationale for selection

The osprey is included on the USFWS (1982) list of national species of special emphasis and is recommended as a target species because of management interest within Oregon, and because of the potential for habitat improvement in the project areas.

#### (b) Needs within the project areas

To ensure the welfare of the osprey, suitable nesting trees and a fish prey base are required. Protection of existing nest trees, as well as providing future nest sites, is needed at the project areas. Guidelines are available regarding snag retention and timber management at areas used by ospreys.

(c) Management goals

Specific management goals, beyond maintenance of current population levels and required habitat, have not been established for Oregon.

F. Waterfowl

1. Wood duck

(a) Rationale for selection

The wood duck is listed by USFWS as a national species of special emphasis (USFWS 1982). The wood duck is recommended as a target species for this reason, as well as because of its recreational importance and loss of riparian and river habitat resulting from the Willamette projects.

(b) Needs within the project areas

Important nesting and brood-rearing habitat inundated by the 3 projects where the wood duck was used as a target species included riparian hardwoods (1,512 acres) and river (736 acres) (Table 1). In order to mitigate for the loss of 1,947 HU's for wood ducks, there is a need to protect existing suitable habitat in the project areas or to enhance waterfowl habitat elsewhere in the Willamette Basin. The USFWS identified the most critical problem confronting wood ducks as loss of wintering and production habitat, represented by bottomland hardwoods and riparian areas (USFWS 1984). Duck numbers in the Willamette Valley have fluctuated widely during the last 30 years, but appear to be in a downward trend (ODFW undated).

(c) Management goals

Specific management goals for the wood duck in Oregon are not available. An objective for the Willamette Valley Federal Refuge Complex is to provide brood habitat for 300 wood ducks annually (Willamette Valley and Coastal Refuge Complex Staff 1980). Goals identified in ODFW's Willamette Valley waterfowl management plan are to maintain and enhance wintering and breeding habitat for waterfowl (ODFW undated). Another goal is to provide a wider distribution of waterfowl by increasing the number of developed waterfowl areas throughout the Willamette Valley. Among the Willamette projects, Dexter Reservoir has moderate potential for waterfowl use to provide the desired dispersal pattern; the other reservoirs have low potential for waterfowl use (Denney 1982).

## VI. References Cited

- Bedrossian, K. L., R. D. Carleson, J. H. Noyes, and M. S. Potter. 1984. Status review of wildlife mitigation at Columbia Basin hydroelectric projects, Oregon facilities. Oreg. Dep. Fish and Wildl., Environ. Manage. Sect. and U.S. Dep. Energy, Bonneville Power Adm., Div. Fish and Wildl. Paging various.
- \_\_\_\_\_, J. H. Noyes, M. S. Potter, and J. B. Glad. 1985a. Wildlife and wildlife habitat loss assessment at Cougar Dam and Reservoir Project, South Fork McKenzie River, Oregon. Oreg. Dep. Fish and Wildl., Environ. Manage. Sect. and U.S. Dep. Energy, Bonneville Power Adm., Div. Fish and Wildl. In press.
- \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_. 1985b. Wildlife and wildlife habitat loss assessment at Dexter Dam and Reservoir Project, Middle Fork Willamette River, Oregon. Oreg. Dep. Fish and Wildl., Environ. Manage. Sect. and U.S. Dep. Energy, Bonneville Power Adm., Div. Fish and Wildl. In press.
- \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_. 1985c. Wildlife and wildlife habitat loss assessment at Hills Creek Dam and Reservoir Project, Middle Fork Willamette River, Oregon. Oreg. Dep. Fish and Wildl., Environ. Manage. Sect. and U.S. Dep. Energy, Bonneville Power Adm., Div. Fish and Wildl. In press.
- \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_. 1985d. Wildlife and wildlife habitat loss assessment at Lookout Point Dam and Reservoir Project, Middle Fork Willamette River, Oregon. Oreg. Dep. Fish and Wildl., Environ. Manage. Sect. and U.S. Dep. Energy, Bonneville Power Adm., Div. Fish and Wildl. In press.
- Bull, E. L., and E. C. Meslow. 1977. Habitat requirements of the pileated woodpecker in northeastern Oregon. J. For. 75(6):335-337.
- Bureau of Land Management. 1979. Unit resource analysis, Eastside Salem. U.S. Dep. Inter., Bur. of Land Manage., Salem District Office. 144 pp + append.
- Denney, R. 1982. Willamette Valley waterfowl status report. Oregon Dep. Fish and Wildl., Portland. np.
- Eastman, D. 1980. Letter to Rod Canutt, USFS, 20 June 1980. Oreg. Dep. Fish and Wildl., Portland.
- Forsman, E. D., K. M. Horn, and G. W. Mires. 1985. Northern spotted owls. Pages 259-267 in E. R. Brown, ed. Management of wildlife and fish habitats in forests of western Oregon and Washington. Part 1. U.S. Dep. Agric., For. Serv., Pacific Northwest Reg.
- Franklin, J. F., and C. T. Dyrness. 1973. Natural vegetation of Oregon and Washington. U.S. Dep. Agric., For. Serv., Gen. Tech. Rep. PNW-8. 417 pp.

**APPENDIX B  
INTERAGENCY HABITAT EVALUATION GROUPS**

Project	Name	Agency
Green Peter-Foster	Geoff Dorsey	USACE
	Larry Gangle	USFS
	Wayne Logan	BLM
	Jim Noyes	ODFW
	Mary Potter	ODFW
	John Sandberg	USACE
	Neil TenEyck	ODFW
	Pat Wright	USFWS
Detroit-Big Cliff	Geoff Dorsey	USACE
	Larry Gangle	USFS
	Ed Harshman	USFS
	Hal Legard	USFS
	Jim Noyes	ODFW
	Mary Potter	ODFW
	Neil TenEyck	ODFW
	Pat Wright	USFWS